Multifaceted III-Nitride Surface-Emitting Laser
Tech ID: 29177 / UC Case 2018-253-0

BRIEF DESCRIPTION
Improved laser capability using III-Nitride VCSELs as the illumination source for sensing applications of a fluorescent sample.

BACKGROUND
Various light sources have been developed for use in fluorescent sensors, such as LEDs, xenon arc lamps, mercury-vapor lamps, halogen bulbs, and lasers. Aside from the lasers, these light sources require filters and other optical modulators to obtain the desired wavelength in a small enough spot size for probing. On the other hand, lasers provide coherent and relatively small spot size light sources with narrow spectral widths which may not require the additional elements. Vertical cavity surface emitting lasers (VCSELs) have a number of qualities that make them desirable: circular beam profile, small spot size, low threshold current, and 2D array capabilities. A VCSEL can be positioned such that the light output illuminates a certain portion of the sample. New technology is continuing to improve VCSELs.

DESCRIPTION
Researchers at the University of California, Santa Barbara improved laser capability by using III-Nitride VCSELs as the illumination source for sensing applications of a fluorescent sample. The incident beams are absorbed by the sample, which fluoresces, and the remaining VCSEL light is filtered out before a detector. The circular beam profile allows for focusing of the beam to even smaller spot sizes, potentially increasing resolution. Applications include, but are not limited to, optogenetic biosensors. This technology also enables stimulation of multiple points of a sample via a VCSEL array. The surface emitting lasers have low threshold currents, which means that the array could be battery powered, making them easier to transport.

ADVANTAGES
▶ Small Circular Spot size
▶ Stimulation of multiple points of a sample via VCSEL array
▶ Low threshold currents for battery power

APPLICATIONS
▶ Optogenetic biosensors
▶ Medical technology
▶ Navigation
▶ Security
▶ Automobiles
▶ 3D Imaging

PATENT STATUS
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Patent Pending

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RELATED CASES
2018-253-0

CATEGORIZED AS
▶ Energy
▶ Lighting
▶ Imaging
▶ 3D/Immersive
▶ Medical
▶ Security
▶ Security and Defense
▶ Cyber security
▶ Screening/Imaging

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Method for Improved Surface of (Ga,Al,In,B)N Films on Nonpolar or Semipolar Substrates
Enhanced Optical Polarization of Nitride LEDs by Increased Indium Incorporation
Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
Low-Density LRP1 As A Regulator of Tau Protein Spread
Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-183)
Internal Heating for Ammonothermal Growth of Group-III Nitride Crystals
Highly Efficient Blue-Violet III-Nitride Semipolar Laser Diodes
Hybrid Growth Method for Improved III-Nitride Tunnel Junction Devices
Phosphor-Free White Light Source
Low Temperature Deposition of Magnesium Doped Nitride Films
Transparent Mirrorless (TML) LEDs
Improved GaN Substrates Prepared with Ammonothermal Growth
Laser Diode With Tunnel Junction Contact Surface Grating
Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
High Efficiency Semipolar AlGaN-Cladding-Free Laser Diodes
Size-Independent Forward Voltage Micro-LED with an Epitaxial Junction
Method for Enhancing Growth of Semipolar Nitride Devices
III-Nitride Tunnel Junction with Modified Interface
Growth of Polyhedron-Shaped Gallium Nitride Bulk Crystals
Nonpolar III-Nitride LEDs With Long Wavelength Emission
Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
Growth of High-Quality, Thick, Non-Polar M-Plane GaN Films
Method for Manufacturing Improved III-Nitride LEDs and Laser Diodes: Monolithic Integration of Optically Pumped and Electrically Injected III-Nitride LEDs
High-Efficiency, Mirrorless Non-Polar and Semi-Polar Light Emitting Devices
Method for Growing High-Quality Group III-Nitride Crystals
Controlled Photoelectrochemical (PEC) Etching by Modification of Local Electrochemical Potential of Semiconductor Structure
Incorporating Temperature-Sensitive Layers in III-N Devices
Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices
MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
Reduced Dislocation Density of Non-Polar GaN Grown by Hydride Vapor Phase Epitaxy
Heterogeneously Integrated GaN on Si Photonic Integrated Circuits
Methods for Fabricating III-Nitride Tunnel Junction Devices
Low-Droop LED Structure on GaN Semi-polar Substrates
Contact Architectures for Tunnel Junction Devices
Semi-polar LED/LD Devices on Relaxed Template with Misfit Dislocation at Hetero-interface
Photoelectrochemical Etching Of P-Type Semiconductor Heterostructures
Precise Neural Circuit Probe with Reversible Functionality
Semi-polar-Based Yellow, Green, Blue LEDs with Improved Performance
Growth of Semipolar III-V Nitride Films with Lower Defect Density
III-Nitride Tunnel Junction LED with High Wall Plug Efficiency
Scalable, Easy-to-Deploy Protocol for Cas13-Based Virus Detection
Tunable White Light Based on Polarization-Sensitive LEDs
Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar GaN
Growth of High-Performance M-plane GaN Optical Devices
Packaging Technique for the Fabrication of Polarized Light Emitting Diodes
Improved Anisotropic Strain Control in Semipolar Nitride Devices
High Light Extraction Efficiency III-Nitride LED
III-V Nitride Device Structures on Patterned Substrates
Activation of P-Type Layers of Tunnel Junctions in Micro-LEDs
Hexagonal Wurtzite Type Epitaxial Layer with a Low Alkali-Metal Concentration
Method for Increasing GaN Substrate Area in Nitride Devices
Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
Growth of Planar, Non-Polar, A-Plane GaN by Hydride Vapor Phase Epitaxy
GaN-Based Thermoelectric Device for Micro-Power Generation
Limiting Strain-Relaxation in III-Nitride Heterostructures by Substrate Patterning
Improved Manufacturing of Semiconductor Lasers
- LED Device Structures with Minimized Light Re-Absorption
- Growth of Planar Semi-Polar Gallium Nitride
- UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaN Alloys
- III-Nitride Based VCSEL with Curved Mirror on P-Side of the Aperture
- Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-150)
- Suppression of Defect Formation and Increase in Critical Thickness by Silicon Doping
- Enhancing Growth of Semipolar (Al,In,Ga,B)N Films via MOCVD